THE

Malayan Agricultural Journal.

JULY, 1937.

EDITORIAL.

Malayan Pineapples.

The reorganization of the Malayan pineapple industry dates from 1931 in which year a Conference appointed by H.E. The Governor reviewed the position and advanced a number of recommendations most of which have since been translated into action.

The need for reorganization at that time was self-evident. The industry lacked stability, the factories were out of date and did not conform to modern ideas of hygiene. Competition was growing stronger—not only the competition of canned pineapples from other sources, but the competition of the ever-widening range of other canned fruits which are now offered to the public in particularly attractive packings.

The extent to which reorganization has been effected is outlined in an article included in this number on "Recent Developments in the Malayan Pineapple Canning Industry" by Mr. W. J. B. Johnson, the Canning Officer. The improvements to-date are very marked and reflect the determination of the Government to enforce the legislation, besides the very material co-operation of packers and exporters.

Mr. Johnson has experience of up-to-date canning methods which is at the service of the Malayan industry. For his appointment the trade is indebted to the Colonial Development Fund which shares with the Malayan Governments the salary and expenses of Mr. Johnson's work for a period of three years. He arrived at the beginning of 1936 and has established a laboratory equipped with an experimental canning plant, a complete set of tinplate testing apparatus and other apparatus for carrying out tests in connexion with canning. His headquarters will shortly be transferred to Johore, where in the centre of the canning industry he will operate a small experimental factory to demonstrate the use of modern methods of canning and the planning of the work to minimize unnecessary handling and delay. We cannot doubt that this work will be of very great value, and it is hoped that the trade will give their very careful consideration to these investigations.

With the cessation of planting of rubber, with which pineapple as a catch crop was popular in Johore and Selangor, it was feared that the future demand for fruit for canning would be jeopardized by the decrease in area under pineapple cultivation. The situation has, however, been adequately met by the consider-

able extension of the area planted as a sole crop. Increased yields per acre and a longer life may be expected from these areas, so that it is hoped that a larger demand for the canned product and new markets may be found to absorb the considerably increased production which may be expected. In view of the greater care being given to canning, assisted by legislation to enforce improvements, the Malayan canned pineapple trade should succeed in consolidating its present markets and extending sales in new markets.

Manuring of Oil Palms.

Manurial experiments on oil palms in Malaya have now been continued at the Central Experiment Station, Serdang, and on three estates over a period of about seven years. Progress reports have been published in this Journal from time to time which have proved of great use as a guide to the industry in this country. The last report brought the subject matter up-to-date to the end of 1934; an article in the present number carries the experiments to the end of the year 1936. As an appendix we are privileged to include a report by Mr. E. Guest of results of manurial experiments on oil palms conducted in Malaya by Messrs. Imperial Chemical Industries (Malaya) Ltd. Mr. Guest's results fully confirm those reached by Messrs. W. N. C. Belgrave and J. Lambourne of the Department of Agriculture.

Briefly stated, the results shew that oil palms in bearing give a decided response to manuring with ground rock phosphate, and that in order to maintain yields it is desirable that the intervals between applications should not exceed eighteen months. We believe that it has been the experience of certain estates that the fertilizer was without effect in areas where the annual yield was already high. The result of the experiments conducted by the Department of Agriculture, and published two years ago, shewed that on normal soils manuring proved profitable when the yield of oil from eight-year old palms was less than 1,500 lbs. per acre. Manuring with nitrogen and potash separately and together without phosphates has not resulted in increased crops.

Manuring of young palms on one estate showed that there was no response until the palms were about seven years old, when a mixture of fertilizer containing both phosphates and nitrogen gave an increased yield over control plots.

We must again warn our readers that these results should not be treated as necessarily universally applicable, for conditions in other areas may introduce factors widely different from those of the original experiments. While we believe that the results of manuring on oil palm estates in various parts of the country have fully confirmed these results, this fact does not preclude the possibility that blindly following this recommendation without previous trial may lead to a considerable outlay of money without a compensating increase in yield.

The Malayan oil palm industry is fortunate if future results confirm that adequate manuring is confined to the application of ground rock phosphate. Christmas Island rock phosphate dust is an inexpensive fertilizer, and, at present prices, the annual bill for the phosphate and cost of applying is not more than about $2 per acre.

Original Articles.

RECENT DEVELOPMENTS IN THE MALAYAN PINEAPPLE CANNING INDUSTRY

BY
W. J. B. JOHNSON,
Canning Officer.

During the past eighteen months considerable progress has been made in the Malayan pineapple canning industry. These improvements were initiated as a result of the Pineapple Conference which was held in 1931 to enquire into matters affecting the industry and to suggest methods of improvement with special reference to the English market. The most important outcome of the Conference was the introduction of legislation controlling the industry.

The Pineapple Industry Ordinance and Enactments.

Owing to the fact that unhygienic conditions and poor methods of packing prevailed in the factories, and to the varying quality of the canned pineapple exports which led to complaints, the Pineapple Industry Ordinance was introduced in the Straits Settlements in 1934 with corresponding Enactments in the States of Johore and Selangor, in order to control the production of canned pineapples and to safeguard the interests of this increasingly important industry.

The Ordinance provides, in the first instance, for the inspection and registration of the pineapple canning factories, and also for the marking of cans with an embossed mark denoting the factory of origin, enabling a faulty consignment to be traced to its source. To gain registration a factory must comply with a schedule of sanitary requirements, which was drawn up by the health authorities in conjunction with the Department of Agriculture. The factory premises are inspected by the local Health Officer and a report is submitted to the Registrar of Pineapple Factories who may refuse to register or may cancel registration previously granted in consequence of an adverse report.

Provisions were also made for the introduction of regulations at a later date in respect of such matters as the packing and preparation of pineapples and the establishment of a grading scheme.

Improved Factory Conditions.

The most outstanding change that has been brought about as a result of the introduction of the Pineapple Industry Ordinance has been the vast improvement in the design, lay-out and general construction of the canning factories. At first the work proceeded slowly, as any suggestions of drastic alterations in this long-established and conservative industry were regarded with suspicion, but when it was realized that the improvements were for the ultimate good of the industry and that the health authorities were prepared to take firm action, many of the

factory-owners gave their full co-operation in carrying out the required alterations. This action has resulted in the building of several new and excellent factories, much larger and better designed than anything hitherto contemplated in Malaya, while all the old factories which are now operating have been reconstructed to meet the exacting requirements for registration.

In Singapore the four existing factories have been completely rebuilt; in Johore two new and excellently appointed factories have been erected, and five of the remaining factories have been altered to bring them up to the same high standard of cleanliness. The two existing factories in Selangor have been reconstructed so as to qualify for registration, and an additional small new factory has been registered. There are at present fourteen registered pineapple canning factories operating in Malaya, several of which, from the point of view of construction and cleanliness, compare favourably with the best canning factories elsewhere. The estimated maximum capacity of the new factories is in some instances as high as 2,000 cases per eight-hour day but the majority of the factories have outputs ranging from five to fifteen hundred cases of 48 cans per day. In the height of the pineapple season factories frequently work from 18 to 24 hours, thus making the daily outputs considerably in excess of those mentioned above.

The sanitary requirements, to which the canning factories have to conform to obtain registration, prescribe the materials of which floors, walls, pillars and tables in the factory are to be made and state, *inter alia*, that the walls of all rooms in which the the cut fruit is handled shall be lined with white glazed tiles to a height of 5 feet and that there shall be a minimum of 50 square feet of floor space for every operator in the cutting room. The operators must wear clean white suits and caps, and adequate shower baths and sanitary arrangements must be available. It is also usual for operators to wear rubber gloves when handling the cut fruit. Among the many other points in the sanitary clauses are those prescribing the washing of the floors, the preparation of syrup, the cleansing of all implements with which the fruit comes in contact, the quality and quantity of the water supply and the disposal of refuse. Periodical inspections are carried out by the health authorities to ensure that these standards are maintained.

The advantages of the application of automatic machinery for canning purposes have as yet been little appreciated in Malaya; some of the more progressive packers have installed automatic syruping machines and have devised their own conveyors, but owing to the high cost of the plant and to the fact that packers are not certain that practices adopted elsewhere will prove successful in Malaya, completely automatic lines have not yet been installed.

Marketing.

The exports of Malayan canned pineapples have steadily increased since 1918, (see graph) the exports for 1936 reaching the record figure of 76,403 tons, the export value of which was $8,686,085; these exports represent approximately

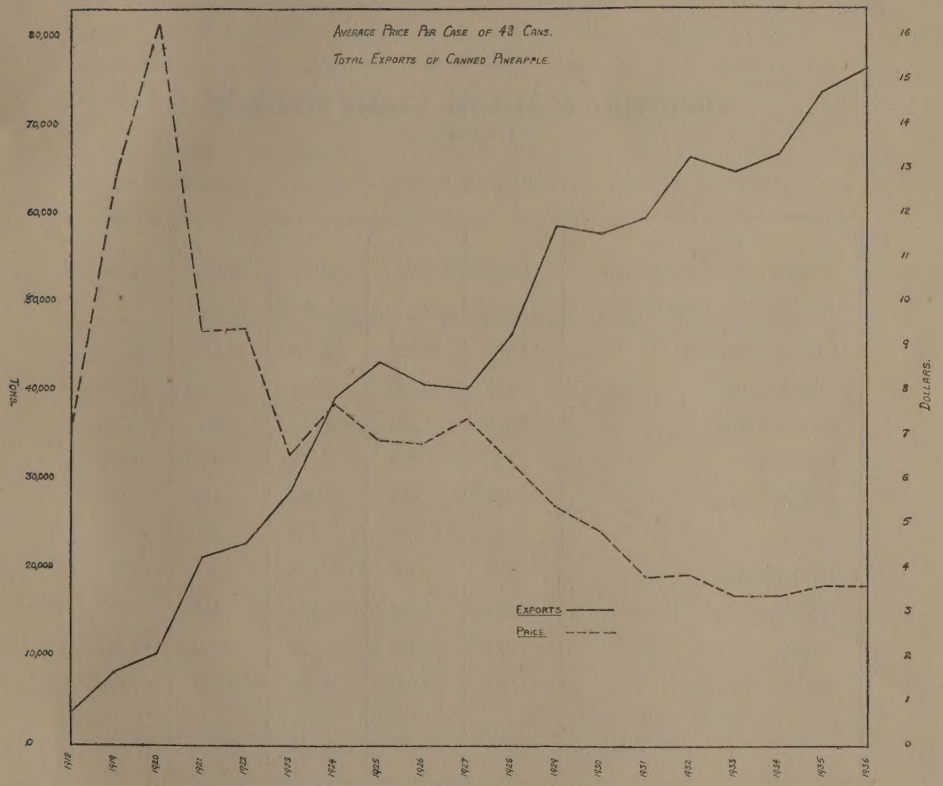
Pineapples Planted as a Sole Crop on Newly-opened Land.

Exterior of New Pineapple Factory.

A Pineapple Cutting Room in a Newly Built Factory.

Washing, Filling and Syruping of Pineapples.

2,377,000 cases of 48 cans of $1\frac{1}{2}$ lb. capacity. The exports would have exceeded these figures had it not been for the fact that the wet summer experienced in the



British Isles curtailed the consumption of canned pineapples, and surplus stocks accumulated in England. These conditions naturally affected the Malayan exports during the latter part of the year, the total for the last three months of 1936 being 12,512 tons as compared with 18,554 tons for the same period of the previous year.

Although about 71 per cent. of the Malayan pack in 1936 was exported to the United Kingdom, there were considerable increases in the exports to Canada, New Zealand, the United States of America and India, due probably to the improved economic conditions in those countries.

It is interesting to note that during the past few years pineapples have been the most important canned fruit imported into the United Kingdom, and that the

bulk of these imports have been from Malaya; in 1935 for instance, 91 per cent. were from Malaya.

Table I shews the distribution of exports of Malayan canned pineapples since 1932.

Table I.

Distribution of Malayan Canned Pineapple Exports.

(in long tons.)

Country of Destination.	1932	1933	1934	1935	1936
United Kingdom ...	55,699	45,806	51,073	54,510	54,655
Canada ...	2,942	6,241	7,942	8,890	11,486
New Zealand ...	1,487	1,539	2,173	2,237	2,730
U. S. A. ...	837	583	616	985	1,675
British India ...	542	675	999	846	1,036
France ...	864	651	453	391	873
Netherlands ...	1,320	1,396	448	2,265	757
Germany ...	380	497	373	463	397
Egypt ...	133	168	158	232	373
Other Countries ...	2,008	2,025	2,399	3,103	2,423
Total ...	66,292	59,581	66,634	73,922	76,405

Fresh Fruit Supplies.

However excellent the canning factory equipment and organization may be, it is impossible to produce a first-quality pack if the fresh fruit supplies are not of the best quality. An article appeared in the February number of this Journal * describing the work that is being carried out at the Pineapple Experiment Station in Singapore to improve the cultivation and strain of pineapples for canning.

Another experiment Station, of 83 acres, for pineapples has been started in Johore, adjoining one of the largest pineapple growing areas. Of this area 49 acres have already been opened up and planted with trial plots; a bungalow for

* Further Experimental Work on Pineapples, by G. D. P. Olds, *Malayan Agricultural Journal*, Vol. XXV, February, 1937.

the officer-in-charge has been built on the Station, and nursery sheds are nearing completion. Experiments in connexion with manuring, planting distances and prevention of soil erosion have already been started.

The majority of pineapples for canning are grown in Johore, in which State there were 56,289 acres planted at the end of 1936, of which 41,867 acres were cultivated as a sole crop, the latter figure representing an increase of 18,441 acres as compared with 1935. In Selangor the total acreage has steadily risen during the last three years, 8,445 acres being recorded at the end of 1936. In Singapore the area planted has decreased during the last four years partly due to the unsuitable hilly land and to the increasing value of property in the island. (Table II).

Table II.

Area of Pineapples in Malaya grown for Canning.

(in acres.)

Territory.	1933		1934		1935		1936	
	Total	Sole Crop	Total	Sole Crop	Total	Sole Crop	Total	Sole Crop
Singapore ...	9,500	5,800	7,500	5,500	7,000	5,000	5,250	3,000
Johore ...	42,644	9,849	35,268	11,529	39,122	23,426	56,289	41,867
Selangor ...	7,618	4,090	6,983	3,427	7,349	3,420	8,445	1,896
Total ...	59,762	19,739	49,651	20,556	53,471	31,846	69,984	45,763

To obtain the best results the fruit should arrive at the factory fully ripe, fresh, clean and undamaged, and to achieve this, considerable care is necessary in the picking and handling of the fruit. If the fruit supplies are obtained from sources not under the control of the canning factory these conditions are seldom obtained. It is, therefore, desirable for the canners to grow their own fruit in order that they may exercise due care to ensure that the fruit should arrive at the factory in the best possible condition. Several of the canners have realized this and large areas of pineapples are now controlled by them. On well-organized plantations elsewhere the fruit is allowed to reach full maturity before it is picked, considerable skill being required to gauge when a pineapple is ripe for picking. The pickers pass between the rows of pineapples with a large bag into which the fruits are placed; when the bag is full it is carried to the nearest plantation road

way where the crown suckers are cut off and the fruit packed into big boxes which are at once taken by rail or lorry to the canning factory. By this system the fruit does not touch the ground and is subjected to the minimum of handling.

Probably the most unsatisfactory aspect of the present organization of the industry is the system whereby those canners who do not control their own plantations compete daily in the fresh fruit market. This results in fluctuating prices and is partly responsible for the irregularities in quality, as the independent growers are tempted to harvest their fruit prematurely when prices are high.

Malayan Mark Voluntary Grading Scheme.

Much has been said in favour of a scheme for grading canned pineapples and it was decided at a meeting of pineapple packers and exporters in May, 1936, that a voluntary grading scheme should be introduced on similar lines to the National Mark Grading Scheme which is operating in England and Wales. The draft regulations for the Malayan Mark Scheme have been drawn up and have received the final approval of the industry; these are to be promulgated under the Pineapple Industry Ordinance and Enactments and it is hoped that the scheme will come into operation in the near future. The regulations provide for the inspection of factory premises, and the sampling of packs of canned pineapples which, if on examination conform to certain standard grades prescribed in the regulations, will be permitted to be sold under the Malayan Mark Label. A small Malayan Mark design has been chosen bearing the grade designation of the pack which will be affixed to cans of pineapples canned under the scheme. These marks may either be affixed as separate stick-on labels or incorporated in the design of the private brand labels, and will serve as a guarantee of the quality of the contents of the can. Two grades of fruit may be packed under the Mark, namely "Golden Grade" for the best quality fruit and "Standard Grade" for medium quality, no provision being made for any inferior fruit.

It is hoped that this scheme will stimulate a general improvement in the quality of the Malayan pack and at the same time prevent any false or misleading labelling of the cans.

Standardization of Can Sizes.

Since the Malayan pineapple industry started, no control has been exercised over the sizes of cans, with the result that many sizes and shapes are being used.

With the introduction of a Grading Scheme and other work that is being carried out to improve the quality and to standardize the pack, it was considered necessary to use standard can sizes.

Early in 1935 the advantages of standardizing can sizes were pointed out to the canners who agreed to co-operate with the Department of Agriculture in effecting this improvement. A small committee consisting of packers, exporters and members of the Department was nominated to select the sizes. Seven sizes were selected and the dimensions tempororily fixed, so that cans might be packed to discover whether the sizes selected were suited to the market. At a recent meeting

of representatives of the industry the seven sizes were finally fixed. The canners agreed that after March 1st, 1938, no cans of less than 3¼ lb. capacity other than those specified shall be used; regulations are being made to enforce the use of these standard sizes.

The diameters of the sizes selected are the same as those of the corresponding English and American standard cans, so that standard automatic machinery may be used, thus obviating the extra cost of special machinery. The adaptation of the majority of canning machines to handle cans of diameters other than those for which they were made, necessitates specially constructed and costly change parts, and in some cases the whole machine would have to be redesigned. Most machines, on the other hand, can be readily adjusted to take cans of varying heights, providing their diameters are standard. The heights of the standard Malayan cans were, therefore, chosen to suit local conditions and in some cases differ slightly from the English standards. Under the present system of working, each factory manufactures its own cans from sheets of tinplate imported from Great Britain, America, Germany, Italy or Japan. All measurements and prices of tinplates are based on the area of the standard box of 112 sheets each measuring 20 x 14 inches, and it is in this form, generally referred to as the Basis Box, that tinplate is usually supplied. Only standard sized sheets of tinplate are at present available in Malaya, and the heights of the cans were chosen so that a convenient number of can bodies might be cut from each sheet with the minimum of waste. Tinplate manufacturers will supply tinplate cut to special sizes at a slightly increased cost, but this was considered undesirable as tinplate importers would have to carry very large stocks of many different sizes of tinplate.

It was decided that cans having a capacity of 3¼ lb. or more should not be standardized, as these larger sizes constitute only a very small proportion of the total pack and are usually only packed for special orders for hotel and confectionery purposes.

Summary.

The most striking development in the pineapple canning industry has been the vast improvement which took place last year in the hygienic conditions of the factories, very large sums of money having been expended by canners in rebuilding factories and in making them thoroughly suitable for the preparation of a food product. These improvements are being implemented by the introduction of the Grading Scheme, the standardization of can sizes and the experimental work carried out by the Department of Agriculture.

THE MALAYAN RUBBER PLANTING INDUSTRY IN 1936.

Compiled from official and other sources by the Economics Branch of the Department of Agriculture, S.S. and F.M.S.

Prices.—The average price per lb. of standard smoked sheet in Singapore for the year was 27.04 cents as compared with 20.23 cents in 1935. The price rose steadily from 22⅜ cents at the beginning of the year to 26 1/16 cents in the middle of February. Thereafter with minor fluctuations between 26 and 27 cents it remained steady till the beginning of October during which month there was a gradual rise to 28 11/16. In November and December there was a further improvement in price, culminating at the end of the year with a sharp rise to 39⅝ cents per lb.

Areas.—The total area under rubber in Malaya at the end of 1936 was estimated to be 3,236,644 acres, as shewn in Table I.

Table I.

Area under Rubber in Malaya as at end of 1936.

State or Territory	Estates*			Small Holdings†	Total Planted Area
	Mature Area	Immature Area	Total Area	Total Area	
Perak ...	289,305	18,596	307,901	244,304	552,205
Selangor ...	331,727	21,842	353,569	133,295	486,864
Negri Sembilan ...	257,747	28,196	285,943	86,274	372,217
Pahang ...	76,715	12,522	89,237	75,887	165,124
Total F.M.S. ...	955,494	81,156	1,036,650	539,760‡	1,576,410
Malacca ...	120,358	3,108	123,466	66,195	189,661
Province Wellesley ...	44,022	1,001	45,023	20,998	66,021
Penang ...	2,569	565	3,134	15,822	18,956
Singapore ...	32,823	659	33,482	20,591	54,073
Labuan ...	—	—	—	2,082	2,082
Total S.S. ...	199,772	5,333	205,105	125,688‡	330,793
Johore ...	442,090	74,086	516,176	359,007	875,183
Kedah ...	200,597	10,031	210,628	104,062	314,690
Perlis ...	1,339	345	1,684	2,916	4,600
Kelantan ...	30,523	1,912	32,435	52,569	85,004
Trengganu ...	12,032	622	12,654	23,276	35,930
Brunei ...	5,928	442	6,370	7,664	14,034
Total U.M.S. ...	692,509	87,438	779,947	549,494	1,329,441
Total Malaya ...	1,847,775	173,927	2,021,702	1,214,942	3,236,644

* Estates = 100 acres and over.

† Small Holdings = under 100 acres.

‡ Figures for small holdings in the Straits Settlements and Federated Malay States are as at the end of 1935, adjusted to include 1936 re-plantings.

Revised statistics for 1936 obtained by the Controller of Rubber indicate an increase in the Federated Malay States of 59,583 acres, of which 21,714 acres are accounted for in the above table by the inclusion under the heading "estates" of small holdings which, the property of one owner, aggregate 100 acres or over. The increase in the case of the Straits Settlements is 5,438 acres.

Of the total area of estate rubber in Malaya, 74 per cent. is European-owned, 17 per cent. owned by Chinese, 4.6 per cent. by Indians and 4.4 per cent. by other nationalities.

Production, Exports and Stocks.—The production of rubber in Malaya during 1936 amounted to 365,005 tons as compared with 378,381 tons in 1935. The distribution of production in 1936 is shewn in Table II.

Table II.*

Malayan Production of Rubber in 1936.

Area	Production by estates of 100 acres and over	Production by estates of less than 100 acres	Total Production
	Tons	Tons	Tons
Federated Malay States ...	125,005	62,596	187,601
Straits Settlements ...	19,397	12,532	31,929
Unfederated Malay States ...	88,716	56,759	145,475
Total 1936 ...	233,118	131,887	365,005
Total 1935 ...	242,882	135,499	378,381

The area of tappable rubber on estates in Malaya was 1,840,646 acres, of which, on an average of monthly returns, 474,027 acres, or 25.75 per cent. were untapped. These out-of-tapping figures refer to areas definitely being rested and exclude areas rested under rotational systems of tapping.

Rotational tapping systems, which provide that the trees shall have a period of rest (usually three or four months), have become increasingly popular on estates. In the Straits Settlements and Federated Malay States, at the end of 1936, 60 per cent. of the tappable area was on rotational systems, while 32 per cent. was on alternate daily tapping, the remainder (8 per cent.) being tapped daily.

The exports of rubber in concentrated forms of latex increased over the previous year by 3,787 tons as shewn in Table III. The quantity of rubber estimated to be contained in this exported latex is included in the figures of production given above and also in the figures of total exports given in Table V.

* Abstracted from the December statement of acreage, stocks, production, imports, and exports of rubber etc. published by the Registrar-General of Statistics, Straits Settlements and Federated Malay States.

Table III.

Export of Rubber in Concentrated Forms of Latex.

Year	Dry Rubber content of Latex in lbs. p. gal:			Total	Value
	4.8 lbs.	4.8 to 5.7 lbs.	Over 5.7 lbs.		
	Tons	Tons	Tons	Tons	$
1931				1,925	
1932				5,192	
1933				10,470	
1934				14,172	
1935	5,286	5,490	2,374	13,150	
1936	6,778	7,073	3,086	16,937	10,673,229

Table IV.

Rubber Stocks in Malaya at end of 1936.

Stocks at ports	...	8,952 tons
„ in hands of dealers	...	27,118 „
„ on estates of over 100 acres		26,044 „
Total	...	62,114 tons

Stocks held by small-holders are considered to be negligible.

Local consumption of rubber by manufacturers of rubber goods, tyres, tubes, belting, shoes etc., amounted to 435 tons, as compared with 593 tons in 1935, 872 tons in 1934 and 2,878 tons in 1933.

Operation of the Rubber Regulation Scheme.—The International Rubber Regulation Agreement continued in force throughout the year. Under that Agreement Malaya received a quota of 569,000 tons. The release for the 1st and 2nd quarters was 60 per cent. and for the third and fourth quarters 65 per cent. The total permissible export during the year was thus 355,625 tons against which, as shewn above, the actual export was 353,702 tons.

The area approved for experimental planting during the year was 3,368 acres. This is limited under the International Agreement to 1 per cent. of the total planted area of Malaya, during the whole period of Regulation.

Table V.
Shipments of Crude Rubber from Producing Countries.*

Tons.

Year	Malaya includ: Brunei & Labuan	Nether-lands Indies	Ceylon	Sarawak	Siam	French Indo-China	All other Sources	Total
1931	423,000	257,000	62,300	10,400	3,600	11,000	32,400	799,700
1932	406,000	211,000	49,300	7,100	3,000	13,500	18,800	708,700
1933	445,800	282,300	63,800	11,100	7,000	17,300	26,200	853,500
1934	467,400	379,400	79,100	17,700	17,700	19,600	38,300	1,019,200
1935	417,005	282,858	54,316	19,465	28,327	28,677	42,074	872,722
1936	353,702	309,732	49,692	21,237	34,578	40,830	46,551	856,322

The area replanted during the year was 20,800 acres. This is limited under the Agreement to 10 per cent. of each owner's holding in any one year, and a total of 20 per cent. during the period 1st June, 1934, to 31st December, 1938.

The regulation scheme worked effectively throughout the year.

Budgrafting.—The total budgrafted area in 1936, and comparisons with previous years, is shewn in Table VI.

Table VI.
Areas of Budgrafted Rubber in Malaya.

	1934		1935		1936	
	No. of areas	Total acreage	No. of areas	Total acreage	No. of areas	Total acreage
Federated Malay States ...	354	103,362	391	106,813	402	111,369
Straits Settlements ...	49	7,769	53	3,885	51	3,833
Unfederated Malay States ...	174	93,560	157	89,311	175	93,734
Total ...	577	204,691	601	200,009	628	208,936

* Abstracted from the Statistical Bulletin of the International Rubber Regulation Committee, Vol. 3, No. 1, January, 1937.

At the end of 1936, of the total area of budded rubber (208,936 acres) 121,442 acres had reached the tappable stage, while the actual area of such rubber being tapped was 47,645 acres.

Conditions on Small Holdings.—Quarterly surveys of small holdings indicated that, with the improved market price of rubber, there was a steady increase in the area tapped. This, however, did not apply to the Federated Malay States, where the percentage of rubber untapped was estimated to be 40 per cent. for the first three quarters of the year, and 37 per cent. at the end of December. In the Straits Settlements, the percentage untapped was 34 per cent. in March and 18 per cent. in December. Johore was estimated to possess 43 per cent. untapped rubber in March, 32 per cent. in June, 24 per cent. in September and 23 per cent. in December. In Kedah, where there was over 50 per cent. untapped in March, this figure steadily declined until in December 35 per cent. was untapped.

Whilst the Rubber Research Institute is solely responsible for all technical research and advisory work for large estates, the Department of Agriculture participates in the work of providing advice and assistance to rubber-growing smallholders.

The Small-Holders' Advisory Service of the Rubber Research Institute is staffed by Asiatic Rubber Instructors, who receive from the Institute their technical information, and are responsible to it for the technical advice they give. Each one works, however, under the immediate control and supervision of the local Agricultural Officer of the Department of Agriculture.

During the year six new Asiatic Rubber Instructors were recruited, all of whom were trained at the School of Agriculture, Malaya. One of the six was recruited specially for service in Brunei where he works for both the Institute and the Department. At the end of the year there were 14 Malay, 3 Chinese, and 2 Indian Rubber Instructors.

The Instructors have succeeded in gaining the confidence of the small-holders and there is no doubt as to the good effects of their work.

When the service was started in 1934, its first task was to improve the quality of the rubber prepared on small holdings. The high quality of the exhibits sent in 1936 to the rubber competitions at Agricultural Shows throughout the country was proof of the success of propaganda in this direction.

A further striking proof of the improvement in the quality of the rubber produced by small-holders lies in the fact that manufacturers in Europe and America complained of a shortage of lower grade blanket crepe. This blanket crepe is remilled from low quality sheet produced mainly on small holdings. Small-holders are now producing better sheet, and this is smoked and exported without further treatment; it does not need to be remilled into blanket crepe, as was the case with the low grade sheet formerly produced on almost all small holdings.

The smoke house for small-holders, introduced in 1935, has been proved capable of producing smoked sheet up to European estate standard, and the ordinary small-holder experiences no difficulty in producing this grade where he has given sufficient attention to cleanliness and rolling in the earlier treatment of his

latex. By the end of 1936 the Rubber Instructors had helped to build 200, and an unknown number had been built by small-holders themselves. Nearly 40 were built for demonstration at various Shows, where, on account of their obvious simplicity and cheapness, they were popular exhibits.

In some parts of the country the small-holders gain considerably by smoking their own rubber, but in other parts the margin of price ruling locally between smoked and unsmoked sheet is so narrow that it is more economic for the small-holder to sell unsmoked sheet to his local dealer. One of the reasons for the narrow price margin is that many small dealers have not been in the habit of grading the commodity, but there are also other factors that affect the question.

With the rise in price of rubber during 1936, small-holders are able to undertake improvements which involve spending money. Budgrafting has been done on a few holdings and replanting is under consideration on several.

Ground conditions on small holdings generally have been improved during the year. The Rubber Instructors try to teach the use and control of desirable jungle plants but holders are rather afraid of encouraging them in case it leads to their receiving a lower assessment under the scheme of rubber control. Some bunding on steep hillsides has been done, and in the low-lying districts drainage has been improved on many holdings.

Conditions on Estates, and the Work of the Rubber Research Institute of Malaya.

Manuring and Replanting.—There was a marked increase in the amount of attention shewn by estates to manuring and replanting during the year.

Much of the replanting is only tentative and is a preliminary to commencing more extensive operations in the coming year. The total amount of replanting which has been started is, therefore, small in comparison with the amount permissible under the scheme of Rubber Restriction.

Manuring is being done in nearly all instances of replanting, but there is only meagre information available concerning the precise manurial requirements of young rubber seedlings on replanted areas.

General interest in the manuring of rubber trees has been much greater and is due to a steadily growing appreciation of the benefits and improvements which are possible by the use of suitable fertilizers. Experimental evidence is still very incomplete, although interesting results have been published from field experiments, but there are numerous aspects still awaiting detailed investigation.

The experimental planting of a limited portion of estate reserve land, as permitted by the International Rubber Regulation Agreement, has been developed into a very comprehensive scheme, and experiments under the direct supervision of the Rubber Research Institute are now in hand dealing with the following points—comparison of different methods of opening jungle; relative values of different types of covers in young clearings; the best age at which to commence manuring; the optimum age at which to commence tapping; the comparison of the effects of fertilizers on different clones on different soil types.

Considerable interest has been shewn by estates in cover plants, both cultivated leguminous and "natural" types. The value of covers in old rubber is now well appreciated and also, if the rubber trees are to get maximum benefits, the necessity for supplementing them with manures. The establishment of leguminous covers in a mature rubber area is still a matter of difficulty, and the Institute is devoting special consideration particularly to the matter of 'inoculation" with the nitrogen-fixing nodule organism. Laboratory work, pot culture trials and field experiments have been planned by the Rubber Research Institute to investigate this problem.

Improved Planting Material.—Early in 1936 experimental plots established on the R.R.I. Experiment Station during the years 1929 and 1930 reached the tapping stage and considerable progress has been made in the study of buddings of the well-known clones, clonal seedlings, seedlings obtained by artificial pollination between selected parents and new clones established from seedling crosses of known high-yielding parentage.

The data obtained during two tapping years on young budded trees of the well-known clones confirm very closely the records of the first tests on the small original groups of trees from which propagation for commercial planting on a large scale has been made.

The early results from tapping of seedling families obtained by means of cross-pollination between high-yielding clones have shewn that the yields of the best families of seedlings may be equal to those of buddings of the best clones. Generally, the illegitimate seedling families from good clones, *i.e.* seedlings grown from the seed collected from budded trees of the clone without any attempt to control pollination, do not give yields of the same high order as the best crosses but they are nevertheless much superior to ordinary unselected seedlings. Certain clones appear to be of outstanding value as parents of high-yielding seedlings.

From the crosses of known parentage, clones were made in 1930 and 1931 and it has been possible to study both the mother trees and buddings made from them, under closely comparable conditions. A number of the new clones established in this manner have given yields of from 7 to 13 pounds dry rubber per tree in the first tapping year. Yields of this order are appreciably greater than those obtained from buddings of the best of the present proved clones available for commercial planting.

The increased interest in replanting has resulted in renewed interest in the selection of improved planting material. The choice between clonal seedlings and buddings of the best proved clones must be made. On the evidence available, buddings of the best proved clones constitute the most reliable material at present available for large scale planting. Although seedling trees may possess certain advantages over budded trees, the proved superiority in the yield of the latter remains the deciding factor for the present. Conclusive proof of the equality of yield of seedlings and buddings has only been obtained from a comparison of small families of legitimate crosses between pairs of selected parents and buddings of the best clones. It has not yet been proved that it is feasible to produce in quantities sufficient for large-scale commercial planting seedlings of the same order of merit as

the small families of seedlings which have been the source of available yield data up to the present time.

Tapping Systems.—Comparison of different tapping systems on mature seedling trees has been continued in an experiment set up by the Rubber Research Institute in 1933. The results obtained to the end of the third year show that there is a general tendency for the yields obtained on the lighter tapping systems to increase slowly in relation to the control—alternate daily tapping on half-circumference without rest. Bark thickness measurements taken in renewed bark after three years fail to demonstrate that periodic resting has had any appreciable effect so far on the rate of bark renewal. In systems which involve tapping simultaneously on two cuts on half-circumference one on each side of the tree, the rate of bark renewal above the tapping cuts appears to be accelerated and below, retarded, in relation to the control.

Comparison of alternate day tapping with A.B.C. and tapping every third day on young budded trees of a number of proved clones has resulted in a loss in total yield approximately equivalent to the reduction in the frequency of tapping. There is no evidence so far that for the clones studied the trees tapped on the lighter systems have benefited by the additional rest.

Tapping of budded trees of two clones, Pilmoor B.84 and D.65, has been continued without rest since May 1929. During the year 1936 tapping has been continued on renewed bark and no change in the trend of yield has been observed. Budded trees of these two clones have yielded 21 and 23 pounds of dry rubber respectively in the 12th year of age.

Pests and Diseases.—Weather and environment are considered to be of paramount importance in connexion with the occurrence and virulence of the leaf mildew fungus *Oidium Heveae*. In general it can be said that the foliage and seed set in the old rubber was even better in 1936 than in the previous year and that the incidence of *Oidium Heveae* in the new leaf was practically nil up to the 10th March, and thereafter was mild and occurred only in the later wintering trees.

During the dry weather experienced from February onwards and even at the end of the year when heavy rains are normally the rule the leaf spot fungi *Helminthosporium Heveae, Gloeosporium Heveae, Colletotrichum* sp. and *Scolecotrichum* continued to give considerable trouble in nurseries and in young rubber in the field.

The thrips pest of leaves of rubber trees was again prevalent on many estates in the west coastal districts of Malaya this year but in very few cases was sulphur dusting to check this pest really needed.

Further reports have been received during the year of cover plants being attacked by fungi which are also parasites of the rubber tree. Among the most common are the three root disease fungi and Pink Disease. The more woody stemmed plants seem to be the chief of those reported to be attacked by Pink Disease, *e.g. Crotalaria* spp.,*Tephrosia* spp., *Indigofera* spp. and *Desmodium ovalifolium*. The growing of heavy covers of these plants in districts known to be susceptible to Pink Disease should be avoided.

Reports continued to be received of cover plants being attacked by a Rust fungus of the group Uridinales, susceptible hosts being *Crotalaria* and *Tephrosia* spp.

Greatly increased interest was taken during the year in problems of root disease control, especially in connexion with replanting. High mortality from root disease is one of the major causes of deterioration in stands of mature rubber, and it is of great importance when replanting old heavily diseased areas to ensure if possible against a repetition of these losses in the replanted stand.

Considerable areas were replanted during the year, methods of clearing ranging from simple tree felling, with no stump—or root—removal, to clean-clearing, followed by deep digging and complete root extraction. From the point of view of root disease control, selective clean-clearing of diseased patches, with a minimum of root removal in the healthy areas, would appear to be the economical policy.

Termites (*Coptotermes curvignathus*) continued to cause serious damage throughout the country, especially in young areas between the ages of 4 and 10 years.

The year was marked by a notable increase in the incidence of the Cockchafer (*Psilopholis grandis*). At the beginning of the year ten estates in various parts of the country were known to be infested, but during the months of June to December this number was more than double. There is still considerable doubt concerning the economic importance of this pest.

Cut-worms (larvae of various species of Noctuid moths) caused damage to bush covers in young clearings in many parts of the country. Some of the outbreaks were severe, but all were restricted to small areas and were sporadic in character. Mealy-bugs (*Pseudococcus* spp.) were more in evidence than usual, though damage was restricted mainly to cover crops. Epidemic outbreaks of nettle-grubs (Limacodidae) were reported from two estates.

The Rubber Research Institute.

A fire which broke out at the Institute's laboratories in September seriously interrupted work and destroyed valuable records of work in progress. Despite these difficulties the affected Branches soon recommenced work at the new headquarters of the Institute which at that time were under construction.

Acknowledgments.

The compiler is indebted to the Rubber Research Institute for practically all the information given above on conditions on estates. Acknowledgment is also made of information on the operation of the Rubber Regulation Agreement supplied by the Controller of Rubber, Malaya.

MANURIAL EXPERIMENTS ON OIL PALMS

BY

W. N. C. BELGRAVE,

Chief Research Officer

AND

J. LAMBOURNE,

Agriculturist.

Accounts of the lay-out, treatments, and yield records of manurial experiments with oil palms have been published in previous numbers of this Journal (1, 2 & 3) and also in "The Oil Palm in Malaya" (4). The experiments were laid down in January, 1929, on two estates (A and B). Preliminary yields were recorded until July, 1930, when the manures were first applied.

The lay-out of the experiment, which was identical on each of the two estates, consisted of 24 plots of ten palms each randomized in two blocks, and the treatments were as follows:—

Sulphate of ammonia (20 per cent. N.) 1 lb. per tree		= N
Superphosphate (18 to 20 per cent. P_2O_5) or Basic slag (16 per cent. P_2O_5)	3 lbs. ,,	= P
Sulphate of potash (48 per cent. K_2O) 1 lb.	,,	= K
Sulphate of magnesia (16 per cent. Mg O) 12 lbs.	,,	= Mg

These fertilizers were applied alone or in combination to give mixtures which for brevity are designated below as NPK, PK, NPK Mg, etc., according to the combination used. Applications were made twice yearly from July, 1930, until July, 1932, and basic slag was substituted for superphosphate in the last two dressings. A further experiment was started in 1932 on Estate C, with young palms, to ascertain the effect of early manuring on subsequent yield. The palms were planted in December 1929, manures were applied in July 1932, and thereafter half-yearly until February 1934. The results of all experiments on manuring oil palms up to December, 1934, were published in the *Malayan Agricultural Journal* for July, 1935, p. 321. Included in that report were experiments concluded at the Central Experiment Station, Serdang, and on Estates A, B & C. For reasons stated in the above-mentioned report, the experiments in Block 21 at the Central Experiment Station, Serdang, and on Estate B were abandoned, and the results of experiments in Block 5 D Serdang are being written up separately. In this article it is proposed to deal only with experiments on Estates A & C.

It has been pointed out in a previous article (3) that the addition of magnesium to the mixtures has had no significant effect on the yields, and for statistical analysis this addition has been ignored. On Estate A there are therefore six replications of each main treatment arranged in two blocks. The results are given in Table I.

Table I.

Yield in lbs of Fruit Bunches per Mature Palm Planted 1922 on Quartzite Hill Soil, Estate A.

Treatment	No. of Mature Palms	1929	1930	1931	1932	1933	1934	1935	1936
NPK	36	100	144	221	254	262	197	132	135
		} 101	} 148	} 234	} 259	} 286	} 198	} 139	} 136
NPK Mg	17	102	157	259	268	334	199	153	138
PK	40	77	127	199	243	234	166	137	167
		} 77	} 118	} 199	} 240	} 247	} 187	} 130	} 147
PK Mg	19	76	100	200	232	273	230	116	105
P	37	82	153	243	256	260	214	143	154
		} 86	} 148	} 240	} 246	} 251	} 209	} 135	} 154
P Mg	17	93	128	234	220	232	200	119	155
Control	53	90	177	167	181	185	141	114	145
Mean		88.5	147.8	210.0	231.3	242.2	184.0	129.5	145.5

Table II shows yields expressed as percentages of the annual general mean for convenience of comparison from year to year, together with the results of statistical analysis.

Table II.

Yields expressed as Percentages of General Means. Estate A.

Treatment	1929	1930	1931	1932	1933	1934	1935	1936
NPK ...	113.9	100.4	111.4	111.9	118.2	107.5	107.3	93.5
PK ...	86.3	79.5	95.0	103.7	102.1	101.6	100.4	101.0
P ...	97.5	100.1	114.4	106.3	103.7	113.9	104.2	105.8
Control ...	102.2	120.0	79.2	78.4	76.4	76.9	88.0	99.7
S.D.* ...	15.0	26.5	16.4	17.9	16.3	19.6	27.7	33.5
M.D.* ...	26.	46	29	31	28	25	34	41
I.C.* ...	20.	36	22	24	22	22	28	34

* S.D. = Standard Deviation.
M.D. = Minimum difference for significance (P = .05) between two treatments.
I.C. = Minimum increase over control for significance.

Table III shows the same results calculated in percentages of the controls.

Table III.

Yields expressed in Percentages of the Controls.

Estate A.

Treatment	1929	1930	1931	1932	1933	1934	1935	1936
NPK ...	112.2	83.6	140.1	143.1	154.6	140.4	121.1	93.2
PK ...	85.6	66.7	119.2	132.6	133.5	132.6	114.0	101.4
P ...	95.6	83.6	143.7	135.9	135.7	148.2	118.4	106.2
Control ...	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

These figures show that up to 1934 all manures produced significant increases over the controls and that phosphatic manure alone is as efficient as the mixtures. Yields from all plots commenced to decrease in 1934 and continued to do so during 1935 when the differences in yield between the manured and control plots were not significant. This indicates that the manure, which were last applied in July, 1932, were no longer effective and that further applications would have been necessary to maintain yields. It would therefore appear desirable that the interval between applications of manures should not exceed eighteen months.

The lay-out of the experiment was changed in August, 1935, when Christmas Island rock phosphate dust was applied to all plots including the controls, and different treatments, to be described later, were given. This has resulted in increased yields over the 1935 figures by the control, P, and PK plots, but yields are still well below the 1934 figures and there is no significant difference between any of the treatments or between treatments and control during 1936.

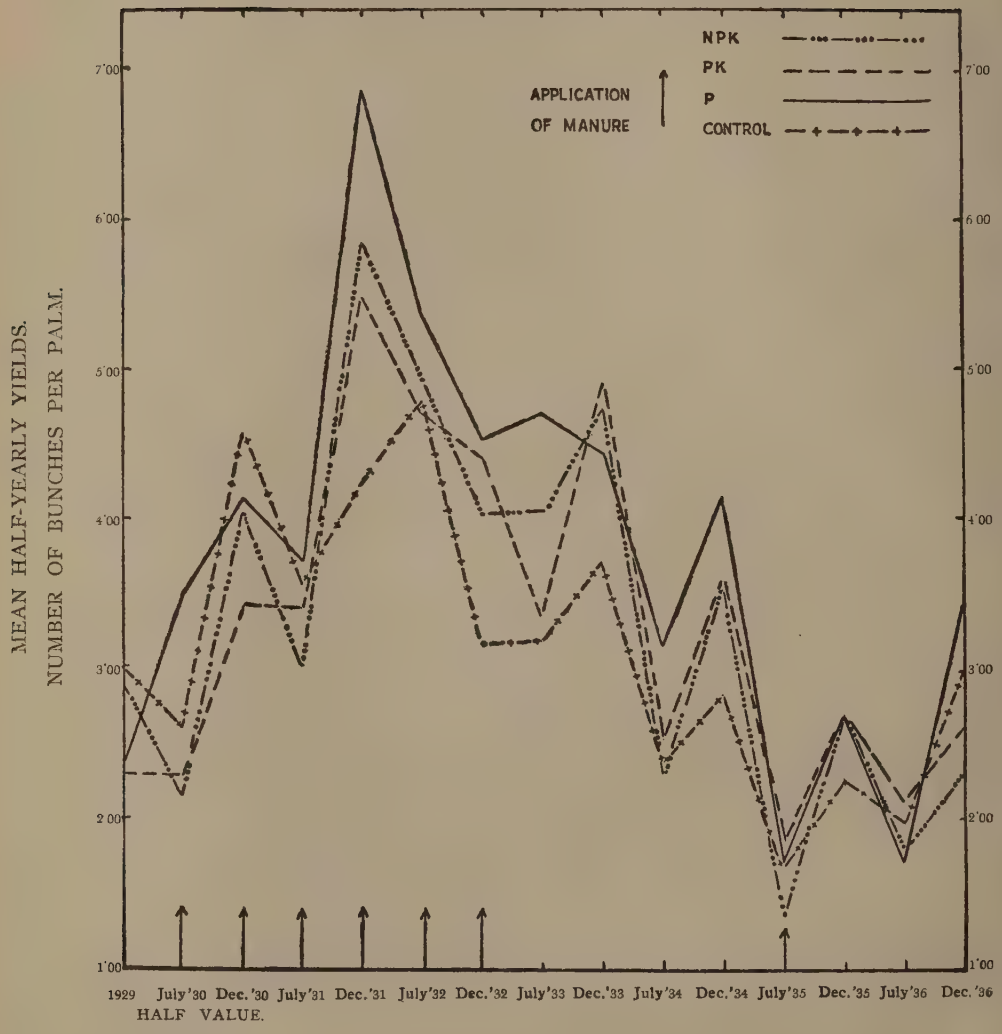
The trend of yields and seasonal fluctuations in yield are clearly shewn in the accompanying graphs. It will be observed that seasonal fluctuations in yield are almost invariably highest in the second half of the year.

Table IV shows mean number of bunches per palm.

By dividing the means in Table I by those in Table IV, mean weights of unit bunches are found (see Table V.)

Expressed as control = 100, Tables IV and V give approximately the figures in Tables VI and VII.

ESTATE A. NUMBER OF BUNCHES PER PALM.



ESTATE A. WEIGHT OF FRUIT BUNCHES.

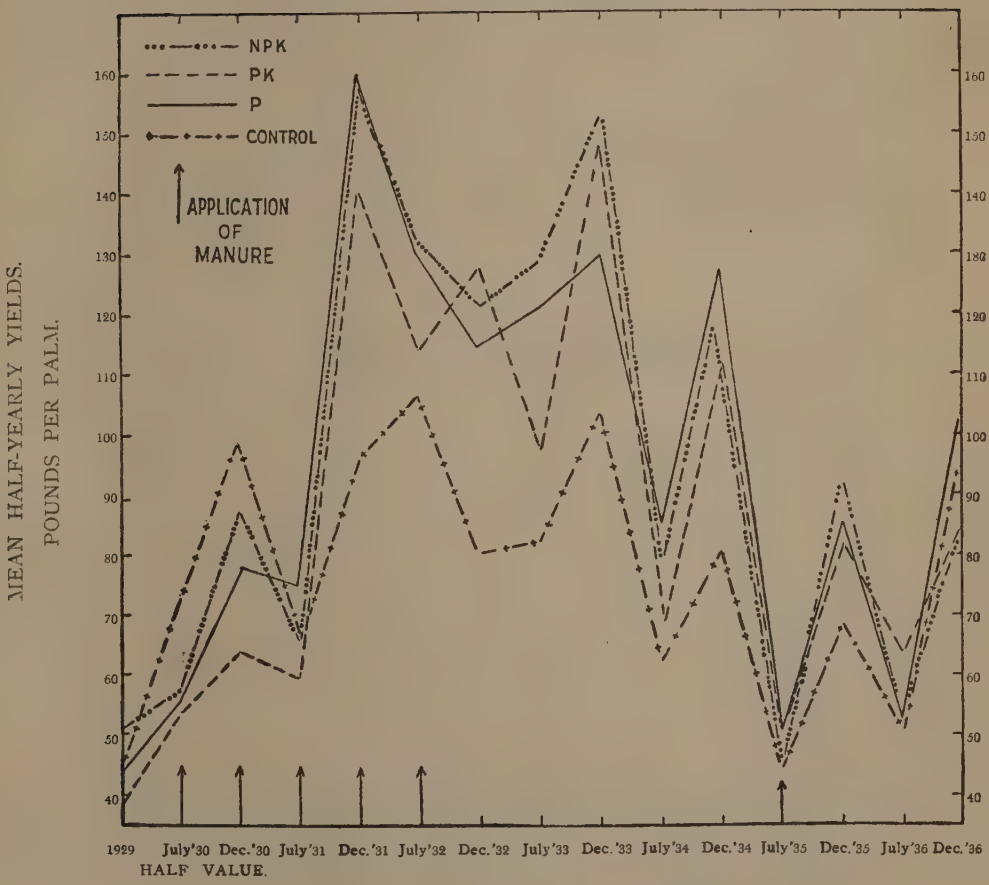


Table IV.

Mean Number of Bunches per Palm.

Estate A.

Treatment	1929	1930	1931	1932	1933	1934	1935	1936
NPK ...	5.8	6.1	8.9	9.2	8.8	5.9	4.4	4.5
PK ...	4.6	5.8	8.9	9.1	8.3	6.2	4.4	4.7
P. ...	4.9	7.9	10.6	9.7	8.7	7.2	4.8	5.6
Control ...	5.6	7.4	7.6	7.9	6.9	5.1	4.3	5.3
Mean ...	5.2	6.8	9.0	8.9	8.2	6.1	4.5	5.0

Table V.

Mean Weights of Unit Bunches.

Estate A.

Treatment	1929	1930	1931	1932	1933	1934	1935	1936
NPK ...	17.4	24.3	26.3	28.2	32.6	33.7	34.9	33.9
PK ...	16.7	20.4	22.3	26.4	29.8	30.1	30.0	31.1
P ...	17.6	18.7	22.6	25.4	28.9	29.3	30.2	30.4
Control ...	16.2	23.9	21.9	23.9	27.0	27.6	29.4	30.0
Mean ...	17.0	21.8	23.3	26.0	29.6	30.2	31.4	31.4

Change in Treatments, Estate A.

As stated above, there was a change in the treatments on Estate A in August, 1935. All plots, including controls, were given a dressing of Christmas Island rock phosphate dust at the rate of 4 lbs. per palm. This was applied in different ways as follows:—

A Manure applied to untouched cover which, in this case, consists mainly of grass and ferns.

B Cover cleared in strips about 4 feet wide round the palms at the limit of leaf spread. Manure was applied and worked into the soil and the strips kept clean weeded.

C As in (B) but cover was allowed to grow again on the cleared strips.

Table VI.

Number of Bunches expressed in Percentages of Control.

Estate A.

Treatment	1929	1930	1931	1932	1933	1934	1935	1936
NPK ...	103	82	107	116	128	115	102	85
PK ...	82	78	107	115	120	121	102	89
P ...	87	106	139	123	126	141	111	106
Control ...	100	100	100	100	100	100	100	100

Table VII.

Weight of Unit Bunches as Percentages of Control.

Estate A.

Treatment	1929	1930	1931	1932	1933	1934	1935	1936
NPK ...	107	101	120	118	121	122	119	113
PK ...	103	85	102	110	110	109	102	104
P ...	108	78	103	106	107	106	103	101
Control ...	100	100	100	100	100	100	100	100

The different treatments were arranged in each block so as to include an equal number of plots of each new treatment in each set of plots under the old treatments. The three new treatments are therefore replicated four times in each of the two blocks, making eight replications.

The mean half-yearly yields in weight of fruit bunches per palm for the period July, 1935, to December, 1936, are given in Table VIII and the same figures, expressed in percentages of the mean, are given in Table IX. These figures show that there is no significant difference between yields from the plots under different treatments and that to December, 1936, the dressing of rock phosphate does not appear to have affected the yields in total weight of fruit bunches.

Table VIII.

Mean Yields in lbs. of Fruit Bunches per Palm in Half-Yearly Periods from July, 1935 to December, 1936

Treatments	July-Dec. 1935	Jan.-June 1936	July-Dec. 1936	Mean Annual Yields.
A ...	82	57	83	153
B ...	86	52	83	153
C ...	80	58	102	165
General Means	83	56	89	152
S.D. ...	19.49	17.20	32.60	—
M.D. ...	21	19	35	—

Table IX.

Mean Yields of Fruit Bunches expressed in Percentages of the Half-Yearly General Mean.

Treatments	July-Dec. 1935	Jan.-June 1936	July-Dec. 1936
A ...	99	102	93
B ...	104	93	93
C ...	96	104	115
S.D. ...	24.7	32.5	36.6
M.D. ...	25.3	33.9	39.3

Manuring Young Palms, Estate C.

A brief description of this experiment and the results up to December, 1934, were published in a previous number of this Journal (3). The object was to obtain information on the advisability or otherwise of manuring young oil palms and to ascertain what effect it would have upon subsequent yields of fruit. The experi-

mental area is situated on gently sloping land of the hill quartzite type and the palms were planted in December, 1929. The soil surface was covered with a mixture of grasses and cover crops consisting mainly of *Centrosema pubescens*, but *Calopogonium mucunoides* and *Pueraria phaseoloides* were also present.

The experimental plots were laid out in June, 1932, and measurements of the heights and spread of the palms were recorded before manures were applied. From these records it was ascertained that there was satisfactory uniformity in growth, there being no significant difference between the means of plots to be given different treatments.

Manures were applied in July, 1932, and half-yearly until February, 1934. The first fruit bunches were harvested in November, 1932, approximately three years from the date of planting.

The lay-out consists of six replications of each of five treatments, each plot containing eight palms. The manures applied half-yearly were as follows:—

A	Control (No manure)		
B	Calcium cyanamide	½ lb. per palm	= N
C	Basic slag	1 lb. ,, ,,	= P
D	Calcium cyanamide	½ lb. ,, ,,	= NP
	+ basic slag	1 lb. ,, ,,	
E	Calcium cyanamide	½ lb. ,, ,,	= NPK
	Basic slag	1 lb. ,, ,,	
	Sulphate of potash	½ lb. ,, ,,	

At each application of manures the soil round the palms was lightly cultivated to a periphery slightly beyond the limit of leaf spread in order to work the manures into the soil. The control plots were cultivated in the same manner.

No manure was applied between February, 1934 and July, 1935, but during the latter month the treatments were repeated with heavier dressings of manure. On this occasion rock phosphate dust replaced basic slag and the following quantities were applied:—

Calcium cyanamide	2 lbs. per palm	= N
Rock phosphate dust	4 ,, ,, ,,	= P
Sulphate of potash	2 ,, ,, ,,	= K

No manure has been applied since July, 1935. The mean yields in pounds of fruit bunches per palm are given in Table X, and the percentages of the annual general means in Table XI. There is no significant increase in yields due to treatments either in 1934 or 1935, but in 1936 both the NPK and NP plots have produced significantly better yields than the control plots. The NP plots have yielded better than the N and P plots, but there is no significant difference between the NP and NPK plots or between the N and P plots and the controls.

Table X.

Mean Yield per Palm in lbs. of Fruit Bunches.

Estate C.
Palm Planted December, 1929.

Treatment.	Nov. 1932-Dec. 1933	Jan.-Dec. 1934	Jan.-Dec. 1935	Jan.-Dec. 1936
NPK ...	163	214	291	311
NP ...	166	201	274	326
N ...	159	190	249	265
P ...	134	191	246	260
Control ...	144	184	260	249
Means ...	153	196	264	282
S.D. ...	—	34	48	48
M.D. ...	—	42	63	63
I.C. ...	—	38	52	52

Table XI.

Yields expressed as Percentages of the General Means.

Estate C.

Treatment.	Nov. 1932-Dec. 1933	Jan.-Dec. 1934	Jan.-Dec. 1935	Jan.-Dec. 1936
NPK ...	107	109	110	111
NP ...	108	103	104	116
N ...	104	97	94	94
P ...	88	98	93	92
Control ...	94	94	98	88
S.D. ...	—	17.3	18.1	17
M.D. ...	—	21.	24.	22
I.C. ...	—	19.	20.	18

Summary.

1. Manurial experiments on mature oil palms at Estate A are described and the results up to the end of 1936 are given.

2. It is shown that up to 1934 all treatments were significantly better than the controls and that phosphatic manures alone were just as efficient as the mixtures.

3. The figures also show that the cessation of manuring from July, 1932, resulted in considerable reduction in yields and it would appear desirable that intervals between applications should not exceed eighteen months to maintain yields.

4. A change in treatments in August, 1935, in which all plots including the controls were given a dressing of rock phosphate at the rate of 4 lbs. per palm, resulted in increased yields in the controls during 1936, but this application has had no very marked effect upon yields from the other plots.

5. The results of applying manures at half-yearly intervals from July, 1932, to February, 1934, to immature palms on Estate C show that there was no significant response to manures during 1934 and 1935, but that in 1936 both the NPK and NP plots have yielded better than the controls and that NP has given better results than either N or P alone. There is no significant difference between yields from the NP and NPK plots or between the N or P plots and the controls. These results indicate that the palms which were planted in December, 1929, are just beginning to respond to manures.

Acknowledgments.

The writers express their thanks to the agents and managers of the estates on which these experiments have been conducted for permission to conduct them and for help freely given. Also to Mr. T. D. Marsh who supervised the experiments while one of the writers (Mr. J. Lambourne,) was on leave and to Che Shafie bin Mohamed Taib for keeping the records.

References.

1. Experiments on Coconuts and Oil Palms. *Malayan Agricultural Journal,* Vol. XX, March, 1932, p. 109, also Oil Palm Manurial Experiments, p. 304. (Compiled from Departmental records).
2. W. N. C. Belgrave and J. Lambourne. Manurial Experiments on Coconuts and Oil Palms. *Malayan Agricultural Journal,* Vol. XXI, May 1933, p. 212.
3. W. N. C. Belgrave and Staff of the Agricultural Division. Manurial Experiments with Oil Palms. *Malayan Agricultural Journal,* Vol. XXIII, July 1935, p. 321.
4. B. Bunting, C. D. V. Georgi and J. N. Milsum. The Oil Palm in Malaya. *Malayan Agricultural Journal,* Vol. XII, p. 145.

Received for publication 12th April, 1937.

APPENDIX.

MANURIAL EXPERIMENTS CONDUCTED BY MESSRS. IMPERIAL CHEMICAL INDUSTRIES (MALAYA) LTD.,

BY

EVAN GUEST, A.R.C.S., B.SC., A.I.C.T.A.,
Agricultural Adviser to I.C.I. (Malaya) Ltd.

I.C.I. Experiment No. 1 (Selangor).

An earlier report on this experiment, the lay-out of which is three randomized blocks with three treatments: O (Control), NP and NPK, was published in 1935.* The experiment was then in its fourth year, the palms being nine years old. Both fertilizer treatments had given about 40 per cent. increase on the control, which was yielding at the annual rate of 1,400 to 1,450 lbs. of palm oil per acre. There was no significant difference between the increases given by NP and NPK respectively and the application of potash was assumed to be unnecessary at that stage in the development of the palms.

Unfortunately, no treatment with P alone had been included, so that the results threw no light on the relative importance of N and P. The experiment merely proved that the response to biennial dressings of Nicifos A (14 per cent. N: 42 per cent. P_2O_5) at the rate of 5 lbs. per palm was economic and would even show a small profit when the price of palm oil dropped as low as $70 (£8) per ton f.o.b.

The third dressing of fertilizers was due in 1935-36, but it was decided to withhold it with the object of seeing how long the beneficial effects of the previous dressings would last and whether the better vigour of the manured palms would enable them to maintain higher yields than the control indefinitely without further manuring. This object was defeated, however, owing to the accidental manuring of all the plots (including the controls) with rock phosphate (27 per cent. P_2O_5) at the rate of 300 lbs. per acre, both in July, 1934, and in June, 1935. Routine manuring of the leguminous cover crop was being carried out in both these years over the whole of the estate in which this experiment is situated and the experimental area received a general application of rock phosphate along with the rest. However, this oversight has produced an interesting result. In 1936, during the period 18 to 30 months after the first application of rock phosphate, the mean yields of the former controls (now P plots), rose to almost the same level as the NP and NPK plots. The following table gives the mean annual yield of palm oil per treatment since the experiment began in 1931, the yield of oil being calculated as 15 per cent. of the recorded weight of fruit bunches.

* *Malayan Agricultural Journal* Vol. XXIII, 1935, pp. 333-334—Appendix A to Manurial Experiments on Oil Palms, by W. N. C. Belgrave and others.

Period	Age of Palms (years)	Calculated Yield of Palm Oil (lbs. per acre)			Percentage Comparison (control = 100)	
		O/P	NP	NPK	NP	NPK
1931*	5	322	417	328	130	102
1932	6	882	1448	1425	164	162
1933	7	1772	2227	2089	126	118
1934	8	1641	2463	2345	150	143
1935	9	1131	2109	2222	186	196
1936	10	2102	2207	2131	105	101

* Four months yield only (September to December)

The rise in the yield of the control plots in 1936, following the decline in 1935, can only be attributed to the delayed effect of the rock phosphate applied to the cover crop in 1934 and 1935. No corresponding rise has been recorded on the NP and NPK plots, where the palms have presumably been giving their maximum yield since 1933, following the earlier fertilizer applications. The conclusion that P alone was responsible for the former yield increases as well as the present increase in the yield of the control and that N is no more necessary than K thus appears to be fully justified.

A statistical analysis of the plot regressions (yields of fruit bunches for 1936 minus average yields for 1932-34) gave the following result:— Differences in comparison with control (O/P): NP = 1212, NPK = 1170; s.e. of difference 294. An analysis of the regressions 1935/1932-34 did not give a significant difference.

The effect of the accidental manuring of the control plots in this experiment with rock phosphate therefore strongly supports Mr. Belgrave's former conclusions: (1) that manuring with phosphatic manures should be remunerative on normal inland soil where the annual yield at 8 years is not above approximately 1,500 lbs. of palm oil per acre, (2) that the addition of nitrogen and potash is not necessary, and (3) that rock phosphate is a suitable fertilizer to use.

I.C.I. Experiment No. 5 (Perak).

This experiment was laid out in 1934 on young oil palms about four years old, planted in a hilly area of yellow loam soil, previously cleared from virgin jungle. The lay-out is four randomized blocks with acre plots, each of 50 palms. There are five treatments: O (control), P (rock phosphate alone), NPa, NPb and NPc (rock phosphate with (a) sulphate of ammonia, (b) calcium cyanamide and (c) nitrochalk).

Harvesting began when the palms were five years old and the mean yields per treatment for the first two years of bearing are given below:—

Period	Age of Palms (years)	Calculated Yield of Palm Oil (in lbs. per acre)					Percentage Comparison (control = 100)			
		O	P	NP (a)	NP (b)	NP (c)	P	NP (a)	NP (b)	NP (c)
1935	5	2063	2056	2037	2206	1982	100	99	107	96
1936	6	2521	2573	2552	2499	2625	102	101	99	104
Mean	5-6	2292	2315	2295	2353	2304	101	100	100	101

None of the fertilizer treatments has had any effect up to the present. The level of yield is extremely high (over 2,500 lbs. of oil per acre in the sixth year). It appears that the palms are at present able to give their maximum production of fruit on this rich jungle soil without the aid of fertilizers.

Summary.

(1) Two manurial experiments on oil palms are described and the yields since the palms came into bearing are given.

(2) In the first experiment, where the palms are now ten years old, rock phosphate has been shown to increase the yield from a level of about 1,500 to over 2,000 lbs. of oil per acre. The inclusion of N or NP with P has not produced any additional benefit.

(3) In the second experiment, where the palms are now six years old and the level of yield of the control was 2,000 lbs. of oil per acre in the first year of bearing and 2,500 lbs. in the second, neither the application of P nor of NP has produced any effect on yield up to the present.

NOTE ON THE ETHER EXTRACT OF *TEPHROSIA VOGELII*

BY

C. D. V. GEORGI,

Senior Chemist.

The results of a recent analysis of an average sample of prunings of *Tephrosia Vogelii* may be of interest in view of statements appearing in literature from time to time regarding the possibilities of this plant as a vegetable insecticide (1).

The prunings were obtained from the Tanah Rata Experiment Station, Cameron Highlands, where this plant has proved itself the most suitable of the bushy covers as a source of green manure on the Highlands (2). The prunings were taken from bushes which had just started to flower.

The fresh material was separated into the following components: (a) buds and leaflets, (b) petioles, and (c) stalks. The loss in weight on drying the fresh material amounted to approximately 80 per cent. in each case.

Each component was air-dried and ground for analysis. The proportions of the air-dry components were as followes:—

	per cent.
Buds and leaflets	68.4
Petioles	8.8
Stalks	22.8
	100.0

Table I gives the results of analysis of the separate components.

Table I.

Ether Extract of Components of *Tephrosia Vogelii* Prunings.

Constituent	Buds and Leaflets	Petioles	Stalks	Whole Prunings (calculated)
	per cent.	per cent.	per cent.	per cent.
Moisture ...	7.70	8.82	9.76	8.20
Ether Extract ...	6.38	3.52	3.44	5.46
Ether Extract (moisture-free basis)	6.91	3.86	3.81	5.95

The amount of ether extract is very low compared with that for a high-grade root, for example, *D. elliptica* Changi No. 3, with 27 per cent., calculated on a moisture-free basis.

References.

1. Worsley, R. R. Le G. The Insecticidal Properties of Some East African Plants. I. *Annals of Applied Biology*, Vol. XXI, No. 4, November, 1934, p. 649.
2. Curtler, E. A. Guide to the Experiment Station, Tanah Rata, Cameron Highlands, Federated Malay States. Special Bulletin, Department of Agriculture, S.S. and F.M.S., General Series No. 18, 1934.

Received for publication 26th April, 1937.

Review.

Citrus Diseases and Their Control.

By Howard S. Fawcett, McGraw-Hill Book Company, New York and London. 1936, pp. xv + 656. Illustrated. Price thirty-six shillings.

This second edition of Fawcett and Lee's well known book on citrus diseases has been thoroughly revised and largely re-written. A number of new sections have been added. These include descriptions of mal secco, areolate spot, sweet-orange fruit scab, Australian citrus scab, Clitocybe root rot, hard root rot, Macrophomina root rot, infectious mottling, zonate chlorosis, red root disease and Ganoderma root rot. A new chapter on diseases due to deficiency and excess of inorganic constituents, written in collaboration with Dr. A. R. C. Haas, forms a valuable addition. The bibliography has been enlarged and brought up-to-date. The same high standard which characterized the illustrations in the first edition is maintained. It goes without saying that this book should be in the possession of all who are concerned in the cultivation of citrus.

R. A. A.

Departmental.

FROM THE DISTRICTS.

Compiled by the Chief Field Officer from Monthly Reports by Agricultural Officers.

June, 1937.

The Weather.

June is normally a month of comparatively low rainfall throughout Malaya, but this year the figures recorded at stations have been even below the average for the month in nearly all instances. A marked exception is Taiping in Perak where the figures recorded for the month considerably exceed the average.

In Kelantan rainfall approximated to normal and was well distributed.

Remarks on Crops.

Padi.—Shortage of water owing to the dry weather prevented further ploughing being done in most parts of Kedah after the middle of the month and operations were similarly held up in the north of Province Wellesley and prevented a start being made with cultivation in the Sungei Acheh area. In Krian there has been similar delay in the sowing of nurseries, although water was present in sufficient quantity for this purpose. In Malacca, cultivation is proceeding normally except in areas dependent solely on rainfall for their water supply. Transplanting is practically completed in the Lipis District of Pahang and is in progress in the Temerloh and Bentong Districts and in the up-river mukims of East Pahang. In Kelantan the cultivation of land for dry padi is fairly general and a satisfactory start has been made with the sowing of nurseries of wet padi. Ploughing competitions were held in the Raub District of Pahang and demonstrations in ploughing were given both in Pahang and in the Segamat District of Johore. In the Lipis and Temerloh Districts of Pahang many cultivators have adopted the *tajak,* the use of which instrument has been demonstrated to them during the past few seasons. Another break with past customary practice in parts of Pahang as the result of the demonstration of better methods is evidenced by the increasing tendency to make use of raft nurseries instead of dry nurseries.

Rubber.—A striking feature of this month's reports is the almost complete unanimity with which it is recorded from all parts of the country that there has been a decided slump in the prices offered for coupons, whereas the prices for uncouponed rubber have remained steady or even hardened, notwithstanding that the world market price of the commodity has declined. The result has been a marked increase in tapping generally on small holdings. Recorded prices for coupons range around $12 per picul equivalent and for uncouponed rubber from $22 a picul in Malacca to as high as $29 in Penang.

From several circles it is recorded that Mouldy Rot disease is more in evidence. In no case is it directly suggested that there is any connexion between this and the increase in tapping on small holdings, but it seems natural to assume the probability of such a connexion.

In Kelantan the demand for mangles for machining rubber has still further increased and sixty-six orders were received by the Department during the month. In Brunei a further 15 smoke cabinets were erected.

Pineapples.—Johore reports record that the supplies of fruit showed a tendency to diminish during the month, whereas in Selangor supplies were much more plentiful than in May. A heavy crop of good size fruits is being produced on the closely planted peat area at Sijangkang in Selangor.

Coconuts.—It is recorded from Province Wellesley, Selangor and Johore that heavy crops are now being produced. The fact that this increased production is just as general throughout the country as was the severe drop in crop during the last quarter of 1936 indicates that both are due to climatic conditions which must have been similarly general for Malaya.

Agricultural and Padi Stations.

Agricultural Stations.—Robusta coffee at Ayer Itam Station, Penang, is showing the same symptoms of chlorosis as have been experienced previously with this crop at Kuala Kangsar and Bukit Mertajam Stations. Although it is not suggested that lack of shade is the sole cause of this condition, yet accumulated evidence indicates that it is probably contributory and it is very desirable that robusta coffee on the plains should be provided with some shade. At Cheras Station in Selangor some 5,000 suckers of the Klang green pineapple have been planted to provide material for selections. At Sungei Udang Station in Malacca a fairly satisfactory start has been made in again establishing a flock of poultry with material from the School of Agriculture, Serdang. It is recorded, however, that there was a rather large proportion of infertile eggs amongst those first placed in the incubators. In Kelantan satisfactory progress was made in supplying night arks and other accessories for poultry at the Central and Bachok Stations. In Johore further fruit trees were planted on the Tangkak and Jementah Stations.

Padi Stations.—The dry weather in the middle of the month held up further ploughing on Telok Chengai Station in Kedah and some shortage of water is reported from some of the Krian Stations. In Perak, on the 20 acre trial block at Bota, where padi was planted to ascertain whether a crop could be grown successfully in a January to July season, only the strains Radin Siak 34 and Nachin 756 have borne a small crop of grain. Neither the two strains of Radin planted nor the Siam 29 show any signs of producing panicles, although they have been planted for six months. The plants of these three strains show a tendency to renewed growth and the plot is being maintained in order to ascertain whether or not the plants will produce a crop in the normal harvesting season.

DEPARTMENTAL NOTES.

Death of Nik Jaffar bin Nik Mahmood, Malay Agricultural Subordinate.

We regret to record the death of Nik Jaffar bin Nik Mahmood, Malay Agricultural Subordinate, which took place at Kota Bharu, Kelantan, on 14th June 1937.

Change of Titles.

In accordance with the ruling for titles of officers in the Unified Agricultural Service, approved by the Secretary of State for the Colonies, the following changes of title have been made and will be effective from July 1st 1937.

Old Title.	New Title.
Agriculturist	Senior Agriculturist
Senior Assistant Agriculturist Assistant Agriculturists	Agriculturist
Government Entomologist	Senior Entomologist
Assistant Entomologist Rice Research Entomologist	Entomologist
Chemist	Senior Chemist
Assistant Chemist	Chemist
Soils Chemist	Senior Chemist (Soils)
Rice Research Chemist	Chemist (Soils)
Chemist, Coconut Products	Chemist (Coconut Products)
Assistant Botanist Rice Research Botanist	Botanist
Mycologist	Senior Plant Pathologist
Assistant Mycologist	Plant Pathologist
Agricultural Economist and Editor	Agricultural Economist
Assistant to Agricultural Economist and Editor	Assistant to Agricultural Economist

The designations in brackets are intended for local use only.

Leave.

Mr. Gunn Lay Teik, Assistant Analyst, has been granted 6 months and 14 days leave from 3rd July 1937 to 16th January 1938 inclusive. Mr. Gunn Lay Teik is proceeding to England where he will take a four months' course of study at the Animal Nutrition Research Institute, Cambridge.

Mr. A. Thompson, Senior Plant Pathologist, has been granted 211 days leave from 3rd July 1937 to 29th January 1938 inclusive. During his absence on leave, Mr. R. A. Altson, Plant Pathologist, will act in the senior appointment.

Mr. E. A. Curtler, Agricultural Officer, has been granted 178 days leave on medical grounds, from 3rd July to 27th December 1937 inclusive. Mr. Curtler has for some years been in charge of the Experiment Station, Cameron Highlands. During his absence Mr. B. A. Lowe will be in charge of the Station.

Mr. J. H. Dennett, Senior Chemist (Soils), has been granted 202 days leave from 7th July 1937 to 24th January 1938 inclusive. During his absence Mr. R. G. H. Wilshaw, Chemist (Soils), will act as Senior Chemist (Soils).

Mr. A. E. Coleman-Doscas returned from leave and resumed duty as State Agricultural Officer, Johore, on the 10th June 1937.

Recent Departmental Puplications.

Attention is drawn to the following leaflets and special bulletins which have recently been published by the Department of Agriculture.

Leaflets (for circulation in Malaya only).

No. 16. Budgrafting Fruit Trees.
17. Composting.
1. Derris (Second and revised edition).

Special Bulletins.

Economic Series.

No. 8. Malayan Agricultural Statistics 1936.

General Series.

No. 26. Reports of the Research, Economic, and Agricultural Education Branches for the year 1936.

Scientific Series.

No. 20. Insects, Fungi and Bacteria Associated with Copra in Malaya.

Statistical.

MARKET PRICES.

June, 1937.

Major Crops.

Rubber.—Prices were still lower during the month, and the Singapore market dropped 1 cent between the opening and closing quotations. Spot loose opened at $32\frac{7}{8}$ cents per lb. as compared with the May closing price of $34\frac{1}{8}$ cents. After minor fluctuations the price fell to 31 cents on the 10th and 11th, but improved to round 32 and 33 cents until the close when it fell again to $31\frac{7}{8}$ cents.

The average Singapore price for the month of No. 1. X Rubber Smoked Sheet was 32.31 cents per lb. as compared with 35.94 cents in May. The London average price was 9.57 pence per lb., and the New York price 19.20 cents gold, as compared with 10.25 pence and 21.07 cents gold in the previous month.

Prices paid for small-holders' rubber at three centres during the month are shewn in Table I.

Table I.

Weekly Prices Paid By Local Dealers for Small-Holders' Rubber, June, 1937.

(Dollars per Picul.)

Grades.	Kuala Pilah, Negri Sembilan.				Kuala Kangsar, Perak.				Batu Pahat, Johore.				
	3	10	17	24	2	9	16	23	2	9	16	23	30
Smoked sheet		37.50	39.21	39.11	40.00	39.50	38.00	34.00					
Unsmoked sheet	40.00	35.81		32.15					37.50	33.79	35.80	36.00	35.50
Scrap			26.00	25.23									

Transport by F.M.S.R. lorry service Kuala Pilah to Seremban 12 cents per picul, to Malacca excluding duty, 25 cents per picul, by rail Seremban to Penang $1.24 per picul, Seremban to Singapore $8.00 per ton.

Transport from Batu Pahat to Singapore by lorry excluding duty, 90 cents per picul.

Transport from Kuala Kangsar to Prai by railway $6.20 per ton.

Transport from Kuala Kangsar to Singapore by railway $10.00 per ton (minimum consignment 5 tons).

At Kuala Pilah the standard deduction for moisture in unsmoked sheet is 5 per cent.

At Kuala Kangsar the standard deduction for moisture in unsmoked sheet is 10 per cent.

No purchases at Kuala Kangsar on the 30th June.

Palm Oil.—Table II shews the slight improvement in the market for the Malayan commodities during June.

Table II.
Prices of Palm Oil and Palm Kernels.

Date 1937.	Palm Oil in Bulk, c.i.f. landed weight Liverpool/ Halifax.	Palm Kernels, c.i.f. landed weight London/ Continent
	per ton	per ton
June 4	£ 21. 10. 0	£ 12. 2. 6
„ 11	22. 15. 0	12. 5. 0
„ 18	22. 0. 0	12. 5. 0
„ 25	22. 0. 0	11. 17. 6

Copra.—After an initial slight improvement, the Singapore market fell almost steadily throughout the month. The sun-dried grade opened at $6.30 per picul, and after hardening to $6.40 on the 4th, 5th and 7th June, weakened to close at $5.75, averaging $6.11 per picul as compared with $6.55 in May. The mixed grade varied between 40 and 50 cents lower, averaging $5.64 per picul as against $6.05 in May.

Copra cake remained unchanged at $2.50 per picul.

Rice.—The average wholesale Singapore prices of rice per picul in May were as follows:— Siam No. 2 (ordinary) $4.21, Rangoon No. 1 $3.62, Saigon No. 1 $3.60, as compared with $4.40, $3.57 and $3.70 in April, and $3.96, $3.55 and $3.65 in May 1936.

The average retail prices in cents per gantang of No. 2 Siam rice in May were: Singapore 28, Penang 36, Malacca 32, as compared with 29, 37 and 33 respectively in April.

The average declared trade value of imports of rice during May was $3.88 per picul as compared with $3.91 in April and $3.92 in March.

Padi.—The Government Rice Mills, Perak, continued to pay $2 per picul for padi during June. Retail prices of padi ranged from 7 to 15 cents per gantang.

Pineapples.—The price of G.A.Q. Sliced Tall fell 5 cents to $3.10 per case, but otherwise the May prices continued unchanged; these were (per case):— G.A.Q.: Cubes $3, Sliced Flat $2.90, Sliced Tall $3.10; Golden Quality: $3.30, $3.30 and $3.45 respectively.

Prices of fresh fruit per 100 during June were as follows:— Selangor 60 to 80 cents; Singapore $1.10; Johore 1st quality $1.50 to $2.20, 2nd quality $1 to $1.80, 3rd quality 50 cents to $1.20.

Beverages.

Tea.—During June seven consignments of Malayan tea were sold on the London market, two of upland and five of lowland tea. The former were sold at 1s. 2½d. per lb., and the latter at average prices ranging from 1s. 1½d. to 1s. 2d. per lb.

Average London prices per lb. during June for consignments of tea from other countries were as follows:— Ceylon 1s. 3.15d., Java 1s. 1.42d., Indian Northern 1s. 2.78d., Indian Southern 1s. 2.54d., Sumatra 1s. 0.22d.

The latest Colombo average prices available quoted from *The Weekly Tea Market Report,* 29th June 1937, of the Colombo Brokers' Association, are as follows, in rupee cents per lb.:— High Grown Teas 76 cents, Medium Grown Teas 72 cents, Low Grown Teas 70 cents.

Coffee.—Sourabaya coffee improved in Singapore to average $16.88 to $18.88 per picul as compared with $15.94 to $17.94 in May. Palembang varied little, averaging $11 to $11.88 per picul.

Prices of other varieties of coffee in Singapore are now being obtained and will be quoted regularly in future. Liberian ranged from $17 to $19 per picul, averaging $18; Excelsa $12 to $13, averaging $12.40; Robusta $11 to $12, averaging $11.20.

Spices.

Arecanuts.—Singapore prices were still lower during June. Splits averaged $4.94 to $6.94 per picul, Red Whole $5.94 to $7.12, Sliced $10.62 to $13.62.

The averages of the Singapore Chamber of Commerce quotations per picul were:— Best $6.94, Medium $6.50, Mixed $5.75.

Pepper.—There was an entire absence of demand at the beginning of June, but prices hardened later in response to demand in London. Average prices per picul were: Singapore Black $9.06, Singapore White $15.75, Muntok White $16.25.

Nutmegs.—With lack of demand, prices weakened in the second half of the month, though averages were higher than in May. Average prices per picul in June for both 110's and 80's were $33.38 as compared with $32.40 in the previous month.

Mace.—Prices in Singapore weakened in the second half of the month. Siouw averaged $105 and Amboina $94.50 per picul as compared with $113 and $100 respectively in May.

Cloves.—Nominal quotations for both Zanzibar and Amboina continued unchanged at $40 per picul.

Cardamoms.—Quotations for green cardamoms in the June Ceylon Chamber of Commerce reports ranged from Rs.2.15-Rs.2.25 to Rs.2.12-Rs.2.26 per lb.

Miscellaneous.

Derris (*Tuba Root*).—The Singapore market improved slightly at the beginning of the month but eased off later with decreasing demand, and lower prices were recorded. Roots sold on rotenone content were quoted at $45 per picul, and roots sold on a basis of ether extract at $26 per picul. The May prices were $48 and $30 per picul respectively.

Gambier.—Prices in Singapore continued unchanged at Block $8 and No. 1 Cube $17 per picul.

Tapioca.—Prices in Singapore fell still further during June and were (per picul):— Flake Fair $5, Seed Pearl $5.65, Medium Pearl $6. The May average prices were $5.50, $5.95 and $6.40 respectively.

Sago.—This market also weakened in June and Singapore average prices per picul were:— Pearl, Small Fair, $5.69, Flour, Sarawak Fair, $3.55, as compared with $5.76 and $3.80 respectively in May.

Tobacco.—The range of prices of dried leaf per picul was as follows:— 1st quality $30 to $45; 2nd quality $15 to $38; 3rd quality $9.50 to $30. Prices of prepared tobacco in Kelantan were $100 to $165; $70 to $125; $70 to $85 per picul.

The above prices are based on London and Singapore daily quotations for rubber; on the Singapore Chamber of Commerce Weekly Reports for the month and on other local sources of information. Palm oil reports and certain coffee prices are kindly supplied by Messrs. Guthrie & Co. Ltd., Kuala Lumpur; the Singapore prices for imported coffee and arecanuts by the Lianqui Trading Company of Singapore, and tuba prices by Messrs. Kohyei & Co., Singapore.

1 picul = 133⅓ lbs. The Dollar is fixed at two shillings and four pence.

Note.—The Department of Agriculture will be pleased to assist planters in finding a market for agricultural produce. Similar assistance is also offered by the Malayan Information Agency, 57 Trafalgar Square, London, W.C. 2.

GENERAL RICE SUMMARY*

May, 1937.

Malaya.—Imports of foreign rice during May were 53,553 tons;† exports were 8,384 tons, net imports being 45,169 tons as compared with 45,287 tons in 1936.¶

Of the imports during May, 46 per cent. were consigned to Singapore, 16 per cent. to Penang, 8 per cent. to Malacca, 23 per cent. to the Federated Malay States and 7 per cent. to the Unfederated Malay States. The imports by countries of origin were as follows (in tons, percentages in brackets):—Siam, 30,607 (57.1), Burma 20,654 (38.6), French Indo-China 1,354 (2.5), other countries 938 (1.8).

Of the May exports 72 per cent. were consigned to the Netherlands Indies and 28 per cent. to other countries. The various kinds of rice exported were as follows (in tons, percentages in brackets):—Siam 5,888 (70.2), Burma 2,098 (25.0), French Indo-China 328 (3.9), parboiled 21 (0.3), local production 49 (0.6).

India and Burma.—Foreign exports during the first four months of the year totalled 553,000 tons, equalling exactly the exports of the previous year. Of these exports 4.5 per cent. were to the United Kingdom, 6.9 per cent. to the Continent of Europe, 26 per cent. to Ceylon, 24.8 per cent. to the Straits Settlements and the Far East, and 37.8 per cent. to other countries. The corresponding 1936 percentages were 4.3, 21.2, 25.7, 19.0 and 29.8.

Siam.—Exports of rice and rice products from Bangkok during March were 89,847 tons as compared with 146,823 tons in 1936.

Japan.—The latest information available was published in the March Summary.

French Indo-China.—Entries of padi into Cholon during the the first five months of 1937 totalled 723,097 tons as compared with 766,308 tons in 1936, a decrease of 5.6 per cent. Exports of rice during the same period were 646,346 tons as compared with 786,570 tons in 1936, a decrease of 17.8 per cent.

The Netherlands Indies.—It is reported that 421,087 acres of padi were harvested during January and February as compared with 355,838 acres in 1936, an increase of 18 per cent.

Ceylon.—Imports during January to May 1937 totalled 228,847 tons as compared with 224,456 tons in 1936, an increase of 2 per cent. Of these imports 15.8 per cent. were from British India, 70.3 per cent. from Burma, 0.1 per cent. from the Straits Settlements, and 13.8 per cent. from other countries. The corresponding 1936 percentages were 12.6, 62.9, 0.2 and 24.3.

Europe and America.—Shipments from the East to Europe during the period 1st January to 7th May totalled 463,094 tons as compared with 431,437 tons in 1936, an increase of 7.3 per cent. Of these shipments 51.5 per cent. were from Burma, 37.5 per cent. from Saigon, 7.6 per cent. from Siam, and 3.4 per cent. from Bengal. The corresponding percentages in 1936 were 44.4, 45.0, 8.7 and 1.9.

Shipments for the Levant from the 1st January to 3rd May were 6,250 tons as compared with 6,327 tons in 1936, a decrease of 1.2 per cent. Shipments for Cuba, West Indies and America during the same period totalled 101,554 tons, as compared with 83,425 tons in 1936, an increase of 21.7 per cent.

---

* Abridged from the Rice Summary for April, 1937, compiled by the Department of Statistics, Straits Settlements and Federated Malay States.

† Ton = long ton (2,240 lbs.)

¶ It is to be understood throughout the summary that all comparisons and percentage increases or decreases are in relation to the corresponding period of 1936.

MALAYAN AGRICULTURAL EXPORTS, MAY, 1937.

PRODUCT.	Net Exports in Tons				
	Year 1936	Jan.-May 1936	Jan.-May 1937	May 1936	May 1937
Arecanuts ...	26,548	12,228	13,334	1,577	1,567
Coconuts fresh † ...	114,314†	44,614†	32,979†	6,842†	6,149†
Coconut oil ...	46,507	18,547	14,553	4,163	2,882
Copra ...	76,681	26,548	22,310	5,107	4,791
Gambier, all kinds ...	2,188	897	850	135	173
Copra cake § ...	20,438§	7,557	5,810	1,821	1,419
Palm kernels ...	4,964	1,662	2,530	369	515
Palm oil ...	29,296	8,664	16,289	1,059	3,134
Pineapples canned ...	76,403	32,168	36,432	9,891	8,780
Rubber ¶ ...	365,005¶	138,637¶	181,608¶	26,331¶	35,412¶
Sago,—flour ...	6,180	3,082	8,441	1,632	177
,, —pearl ...	3,319	1,368	1,339	367	221
,, —raw ...	7,484*	3,590*	3,098*	845*	538*
Tapioca,—flake ...	1,535	820	495	133	84
,, —flour ...	2,418*	833*	882*	203*	71
,, —pearl ...	17,797	6,084	7,094	1,082	1,712
Tuba root ...	599	308	262	62	48

† hundreds in number. * net imports. ¶ production. § gross exports.

MALAYAN PRODUCTION OF PALM OIL AND KERNELS

(In long tons, as declared by Estates)

Month 1937	Palm Oil		Palm Kernels	
	F.M.S.	U.M.S.	F.M.S.	U.M.S.
January ...	1,984.8	865.0	360.4	156.0
February ...	1,759.6	1,851.8	323.6	308.7
March ...	1,798.4	1,473.4	358.7	256.1
April ...	1,573.1	1,237.2	308.0	226.0
May ...	1,587.6	1,285.2	257.8	186.4
Total ...	8,703.5	6,712.6	1,608.5	1,133.2
Total January to May, 1936 ...	7,562.4	2,325.0	1,293.8	374.4
Total for the year 1936 ...	23,081.2	8,812.3	3,791.0	1,340.7

ACREAGES OF TAPPABLE RUBBER ACTUALLY TAPPED AND NOT TAPPED ON ESTATES OF 100 ACRES AND OVER, FOR THE MONTH ENDING 31ST MAY, 1937.

STATE OR TERRITORY	Estimated Acreages of Tappable Rubber	Actual area tapped during the month Acreage	Percentage of (3) to (2)	ACREAGES OF TAPPABLE RUBBER NOT TAPPED				AREA OF TAPPABLE RUBBER NEVER BEEN TAPPED		Total area not tapped (5) + (7)	Percentage of (11) to (2)
				ESTATES WHICH HAVE ENTIRELY CEASED TAPPING		ESTATES WHICH HAVE PARTLY CEASED TAPPING (a)					
				Acreage	Percentage of (5) to (2)	Acreage	Percentage of (7) to (2)	Acreage	Percentage of (9) to (2)		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
STRAITS SETTLEMENTS :—											
Province Wellesley ...	43,668	26,370	60.4	210	0.5	17,088	39.1	355	0.8	17,298	39.6
Malacca ...	119,366	78,570	65.8	512	0.4	40,284	33.8	2,677	2.2	40,796	34.2
Penang Island ...	2,722	1,880	69.1	128	4.7	714	26.2	106	3.9	842	30.9
Singapore Island ...	33,153	20,810	62.8	2,422	7.3	9,921	29.9	159	0.5	12,343	37.2
Total S.S. ...	198,909	127,630	64.2	3,272	1.6	68,007	34.2	3,297	1.7	71,279	35.8
FEDERATED MALAY STATES :—											
Perak ...	292,304	212,847	72.8	1,668	0.6	77,789	26.6	10,225	3.5	79,457	27.2
Selangor ...	336,134	243,458	72.4	5,947	1.8	86,729	25.8	13,214	3.9	92,676	27.6
Negri Sembilan ...	264,556	183,324	69.3	3,310	1.2	77,922	29.5	12,700	4.8	81,232	30.7
Pahang ...	83,850	54,929	65.5	5,794	6.9	23,127	27.6	13,132	15.7	28,921	34.5
Total F.M.S. ...	976,844	694,558	71.1	16,719	1.7	265,567	27.2	49,271	5.0	282,286	28.9
UNFEDERATED MALAY STATES :—											
Johore ...	460,575	330,117	71.7	8,578	1.9	121,880	26.4	44,265	9.6	130,458	28.3
Kedah ...	169,355	132,482	78.2	11,411	6.8	25,462	15.0	13,719	8.1	36,873	21.8
Kelantan ...	27,969	21,302	76.2	403	1.4	6,264	22.4	3,508	12.5	6,667	23.8
Trengganu (b) ...	4,817	3,026	62.8	nil	nil	1,791	37.2	100	2.1	1,791	37.2
Perlis (c) ...	1,330	531	39.9	474	35.7	325	24.4	120	9.0	799	60.1
Brunei ...	5,495	3,368	61.3	1,120	20.4	1,007	18.3	898	16.3	2,127	38.7
Total U.M.S. ...	669,541	490,826	73.3	21,986	3.3	156,729	23.4	62,610	9.4	178,715	26.7
Total Malaya ...	1,845,294	1,313,014	71.2	41,977	2.3	490,303	26.5	115,178	6.2	532,280	28.8

Notes :—(a) Area out of tapping on estates which have partly ceased tapping refers to areas definitely being rested and includes areas rested under rotational systems, but excludes areas on any tapping round in respect of Perlis only.
(b) Registered companies only.
(c) Rendered quarterly.

MALAYAN RUBBER STATISTICS

TABLE I

STOCKS, PRODUCTION, IMPORTS AND EXPORTS OF RUBBER, INCLUDING LATEX, CONCENTRATED LATEX AND REVERTEX, FOR THE MONTH OF MAY, 1937, IN DRY TONS.

State or Territory	Stocks at beginning of month 1			Production by Estates of 100 acres and over		Production by Estates of less than 100 acres estimated 2		Imports				Exports including re-exports				Stocks at end of month			Consumption 3	
								during the month		Jan. to May 1937		during the month		Jan. to May 1937						
	Ports	Dealers	Estates of 100 acres and over	during the month	Jan. to May 1937	during the month	Jan. to May 1937	Foreign	From Malay States & Labuan	Foreign	From Malay States & Labuan	Foreign	Local	Foreign	Local	Ports	Dealers	Estates of 100 acres and over	during the month	Jan. to May 1937
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
MALAY STATES :—																				
Federated Malay States ...	...	8,113	13,098	13,384	62,548	3,920	29,162	Nil	Nil	Nil	Nil	13,266	3,221	66,529	21,331	...	7,791	14,225	12	84
Johore ...	...	1,972	4,872	5,945	26,890	3,570	19,257	Nil	231	Nil	652	2,957	6,088	15,023	31,097	...	2,284	5,261	...	...
Perlis ...	...	646	3,162	3,262	15,145	953	5,366	Nil	Nil	Nil	Nil	2,106	1,762	10,213	10,061	...	729	3,426	...	...
Kelantan ...	...	14	10	13	64	18	96	Nil	Nil	Nil	Nil	Nil	24	Nil	151	...	14	17	...	...
Trengganu ...	...	680	274	372	1,726	475	3,406	Nil	Nil	Nil	Nil	437	351	1,410	3,193	...	673	340	...	...
Brunei ...	...	55	50	219	1,243	109	622	Nil	Nil	Nil	Nil	Nil	328	Nil	1,865	...	55	50	...	...
Total Malay States	...	21	56	50	286	75	393	...	...	...	...	...	127	...	650	...	13	62	...	...
	...	11,501	21,522	23,245	107,902	9,120	58,302	Nil	231	Nil	652	18,766	11,901	93,175	68,348	...	11,559	23,381	12	84
S. SETTLEMENTS :—																				
Malacca ...	...	1,633	1,110	1,401	6,493	546	3,267	Nil		Nil		2,274		14,479		...	1,930	1,236	...	...
Province Wellesley ...	...	1,869	572	532	2,531	195	1,077	Nil		Nil		9,879		38,480		...	1,195	652	...	...
Penang ...	3,629	5,069	17	20	76	86	496	2,220	12,459	15,848	67,722		Nil		Nil	931	4,757	23	...	...
Singapore ...	6,408	23,706	185	181	807	77	578	15,096		68,981		20,253		102,933		4,621	23,925	232	35	155
Labuan ...	...	34	Nil	Nil	Nil	9	79	34		240		Nil		Nil		...	35	Nil	...	...
Total Straits Settlements ...	10,037	32,311	1,884	2,134	9,907	913	5,497	17,350	12,459	85,069	67,722	32,386	Nil	155,892	Nil	5,552	31,842	2,153	35	155
Total Malaya ...	10,037	43,812	23,406	25,379	117,809	10,033	63,799	17,350	12,690	85,069	68,374	51,152	11,901	249,067	68,348	5,552	43,410	25,534	47	239

TABLE II
DEALERS' STOCKS, IN DRY TONS 3

Class of Rubber	Federated Malay States	S'pore	Penang	Province We'sly D'dings M'cca.	Johore	Kedah
22	23	24	25	26	27	28
DRY RUBBER	6,406	22,567	4,528	3,017	1,743	244
WET RUBBER	1,385	1,358	229	156	541	485
TOTAL ...	7,791	23,925	4,757	3,173	2,284	729

TABLE III
FOREIGN EXPORTS

PORTS	For month	Jan. to May 1937
29	30	31
Singapore ...	31,647	162,955
Penang ...	14,731	58,825
Port Swettenham.	4,566	26,236
Malacca ...	208	1,051
MALAYA ...	51,152	249,067

TABLE IV
DOMESTIC EXPORTS 4

AREA	For month	Jan. to May 1937
32	33	34
Malay States ...	30,394	158,485
Straits Settlements	2,705	15,052
MALAYA ...	33,099	173,537

Notes:—

1. Stocks on estates of less than 100 acres and stocks in transit on rail, road or local steamer are not ascertained.
2. The production of estates of less than 100 acres is estimated from the formula: Production + Imports + Stocks at beginning of month = Exports + Stocks at end of month. + Consumption, *i.e.*, Column [7] = Columns [13] + [14] + [17] + [18] + [19] + [20] − [2] − [3] − [4] − [5] − [9] − [10]. For the Straits Settlements the production of estates of less than 100 acres is represented by sales or exports as shown by cess paid.
3. Dealers' stocks in the Federated Malay States are reduced to dry weights by the following fixed ratios: unsmoked sheet, 15% wet sheet, 25% scrap, lump, etc., 40%; stocks elsewhere are in dry weights as reported by the dealers themselves.
4. Columns (33) and (34) represent exports of rubber subject to regulation which, for Singapore and Penang Islands are represented by sales or exports as shown by cess paid.
5. All statements are brought up to date monthly, and any inaccuracies that may be disclosed are corrected in the totals; the latest publication, therefore, is always the most reliable.
6. The above, with certain omissions, is the Report published by the Registrar-General of Statistics, S.S. and F.M.S., at Singapore on 24th June, 1937.

METEOROLOGICAL SUMMARY, MALAYA, MAY, 1937.

Locality.	Air Temperature in degrees Fahrenheit							Earth Temperature		Rainfall								Bright Sunshine.		
	Means of			Absolute Extremes						Total.		Most in a day.	Number of days.							
	A. Max.	B. Min.	Mean of A and B	Highest Max.	Lowest Min.	Lowest Max.	Highest Min.	At 1 foot	At 4 feet			Amt.	Precipitation .01 in or more	Precipitation, .04 in or more	Thunder-storm	Fog morning obs.	Gale force 8 or more	Total.	Daily Mean.	Per cent.
	°F	°F	°F	°F	°F	°F	°F	°F	°F	in.	mm.	in.						Hrs.	Hrs.	
Railway Hill, Kuala Lumpur, Selangor ...	90.6	72.8	81.7	95	71	79	76	84.7	85.5	5.83	148.1	0.93	16	15	4	3		196.80	6.35	52
Bukit Jeram, Selangor ...	88.8	73.6	81.2	91	71	83	76	85.4	86.8	9.38	238.3	4.30	14	9	3		3	219.10	7.07	57
Sitiawan, Perak ...	89.5	74.1	81.8	91	72	87	76	85.0	85.1	5.20	132.1	1.89	16	12		1		224.90	7.25	59
Temerloh, Pahang ...	90.1	73.2	81.7	94	71	78	76	86.1	86.5	9.46	240.3	1.88	17	14	3	5		194.55	6.27	51
Kuala Lipis, Pahang ...	89.9	72.5	81.2	92	70	81	74	85.3	85.5	10.18	258.6	3.30	18	14	1	24		191.95	6.19	50
Kuala Pahang, Pahang ...	88.1	74.5	81.3	91	73	82	77	86.6	87.1	5.92	150.4	2.20	11	10				244.60	7.89	64
Kallang Aerodrome, S'pore ...	85.6	76.3	80.9	88	71	80	82	82.5	83.4	12.75	323.9	2.31	21	18	10			183.25	5.91	48
Butterworth, Province Wellesley ...	88.0	74.6	81.3	91	73	84	77	86.2	86.4	8.28	210.3	1.22	20	17	2			196.85	6.35	52
Bayan Lepas Aerodrome Penang ...	87.5	74.9	81.2	91	73	84	77	84.6	85.1	11.04	280.4	3.95	19	15	2			180.65	6.02	49
Bukit China, Malacca ...	85.9	74.7	80.3	88	71	82	78	83.7	84.6	10.04	255.0	2.42	16	14	6		1	217.50	7.02	57
Kluang, Johore ...	89.3	72.2	80.7	93	69	83	75	82.7	83.2	16.17	410.7	5.11	19	14	11	5		188.05	6.07	50
Bukit Lalang, Mersing, Johore	88.2	72.2	80.2	92	68	81	75	82.8	82.4	8.56	217.4	1.92	14	13	2			212.65	6.86	56
Alor Star, Kedah ...	87.9	74.9	81.4	91	72	83	78	85.4	86.2	9.87	250.7	1.91	20	18				219.10	7.07	57
Kota Bahru, Kelantan ...	90.3	74.1	82.2	92	72	87	75	86.1	85.5	7.13	181.1	2.27	17	15	4		1	240.15	7.75	63
Kuala Trengganu, Trengganu	89.0	73.1	81.1	92	71	86	75	84.2	85.3	5.81	147.6	2.78	12	9	6			239.30	7.72	63
HILL STATIONS.																				
Fraser's Hill, Pahang 4268 ft.	75.3	63.6	69.5	80	62	72	65	73.0	73.2	7.38	187.5	2.12	22	19	1	22		167.50	5.40	44
Cameron Highlands, Tanah Rata, Pahang 4750 ft. ...	73.5	58.3	65.9	78	53	69	62	71.1	70.7	7.09	180.1	1.71	27	24	3	5		146.30	4.72	38
Cameron Highlands, Rhododendron Hill, Pahang 5120 ft. ...	72.4	60.0	66.2	77	59	67	61			7.47	189.7	1.74	26	22	3	5		160.35	5.17	42

Compiled from Returns supplied by the Meteorological Branch, Malaya.